Figures 4A through 4C provide a detailed system level explanation of a transformation sequence performed by a color management module according to the present invention. As can be seen in Figures 4A and 4B, RGB color data from source image 150 is input to a color management module 144 for generating CMYK color data in destination image 160. Color management module 144 transforms RGB color data, at source image 150, from a color space corresponding to a source device, such as scanner 80, into CMYK color data, at destination image 160, corresponding to a destination device, such as printer 50, reducing the affects of metamerism when the destination image 160 is viewed under multiple different viewing conditions. It can therefore be appreciated that the present invention is advantageous in color transformation sequences where it is desired that the destination image appear the same when viewed under multiple different viewing conditions.

As also depicted in Figures 4A and 4B, color management module 144 utilizes two sets of spectral measurements to perform the transformation sequence; spectral measurements for source device 406 and spectral measurements for destination device 412.

Turning to the transformation sequence of Figures 4A and 4B, color management module 144 accesses RGB source color data from source image 160 for processing in order to generate CMYK destination color data for destination image 150. A transformation 400 is made on each RGB color value in the source image 150 of the source device into viewing condition dependent XYZ tristimulus values using the spectral measurements for source device 406.

Continuing in the transformation process of Figure 4A, a forward appearance model 401 is applied for source viewing conditions 407 so as to convert the

XYZ tristimulus values into a JCh value in JCh color space or other perceptual color space. This cylindrical coordinate space can be used to describe the appearance of a color independent of its viewing environment, and is therefore an appropriate space to use when gamut mapping colors.

The paragraph at page 13, line 19 to page 14, line 10 has been amended as follows:

Returning to Fig. 4C, inverse appearance transformations 404 map from perceptual color space to target XYZ values. By changing the viewing condition parameters between the forward and inverse models, original XYZ values can be mapped into perceptual color space values and then perceptual color space values are mapped into reproduction target XYZ values. Therefore a reproduction can be produced that yields the same appearance as the original image even though viewed in multiple different viewing conditions. Any combination of colorants that yields the desired target XYZ value on the reproduction will yield the desired appearance. Because of metamerism, it is expected that there be several such combinations. For each of the target viewing conditions *n*, depicted as 409, 410 and 411, the inverse appearance model is used to calculate the desired $X_n^T Y_n^T Z_n^T$ values, the superscript "T" representing "target", in the viewing condition, so as to preserve appearance. For example, if a set of target viewing conditions are Illuminant A, Illuminant D50, and Illuminant F2, then $X_A^T Y_A^T Z_A^T$, $X_{D50}^T Y_{D50}^T Z_{D50}^T$, and $X_{F2}^T Y_{F2}^T Z_{F2}^T$ would be calculated. (In practice, the CIE standard illuminants might not

be used exactly but measurements of "typical" light bulbs and "typical" daylighting). Multiple different inverse appearance transforms are applied to a color value in perceptual color space (such as Lab or JCh space), one each for different viewing conditions, thereby resulting in plural different target color values in a viewing condition independent color space (such as XYZ space), one each in correspondence to the different viewing conditions.

The paragraph at page 17, line 24 to page 18, line 4 has been amended as follows:

Note that the above analysis gave equal weight, and hence importance, to each viewing condition. To assist in determining a best fit, the importance of different ones of the viewing conditions can be weighted 414, 415, 416, as demonstrated in Figures 4B and 5, so as to represent more accurately the probability that any one viewing condition occurs more than others. If one source is either more probable than the others or more important, then weighting may be added to the regression analysis in 405, such that the errors for the most important sources matter more than errors for less important sources. This produces a system that can be used to match each color yielding a reasonable match under the most important sources and reducing metamerism as much as possible for other less important sources.

The paragraph at page 19, line 25 to page 20, line 3 has been amended as follows:

Figure 8 provides a detailed system level explanation of a color management module using a pre-built color lookup table. References 800 through 807 correspond directly to the same items in Figure 4A. Once gamut adjustments 802 are made in perceptual color space, polar coordinates are converted to rectangular coordinates 808. The CLUT Selecter 809 obtains the applicable CLUT from the multiple CLUT's in the color profile, each for a different combination of viewing conditions. Once the CLUT has been selected the CMYK Selector 810 obtains the corresponding pre-calculated CMYK value that is used in the destination image 160.

CONCLUSION

Entry hereof and early passage to issue are respectfully requested.

Applicant's undersigned attorney may be reached in our Costa Mesa, California Office by telephone at (714) 540-8700. All correspondence should continue to be directed to our address listed below.

Respectfully submitted,

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